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DRUG DISCOVERY

Carbon tetrachloride induced renaltoxicity and the effect of aqueous extract of *Gongronema latifolium* in Wistar albino rats

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ABSTRACT

Gongronema latifolium is an important and highly medicinal plant commonly called utazi in Nigeria. It is commonly used as spice, ad vegetable and traditional folk medicine. The kidney by the way is an essential organ and part of the urinary system and serves as natural filter of blood and removal of wastes, among other functions. The objective of this research is to investigate the effect of aqueous extract of leaves of *Gongronema latifolium* on renal toxicity induced by carbon tetrachloride in albino rats. The rats used were divided into four groups namely: control group (group I), the negative control group (group II) which received only the toxin, group III rats were administered 1ml of the extract once daily while 1ml of the extract were administered twice daily to group IV. Renal toxicity was induced using carbon tetrachloride as toxin before treatment with *Gongronema latifolium* extract. The result obtained shows that there was an increase in the level of urea and creatinine after administration of the toxin and as the extract was administered, the level decreased for urea from (19.7±0.78) for group II to (9.8±0.64) for group III. Creatinine level decreased from (10.20±3.24) for group II to (6.00±1.99) for group I in the same vein as urea. The decrease was statistically significant at $p<0.05$. Thus it can be deduced from the research that he leaves of *Gongronema latifolium* has a positive effect on renal dysfunction since it characteristically reduced the level of urea and creatinine which are markers for kidney dysfunction.

Keywords: Renal toxicity, creatinine, kidney, extract *Gongronema latifolium*

1. INTRODUCTION

Gongronema latifolium, commonly called 'utazi' and 'arokeke' in the south western eastern parts of Nigeria, s a tropical rainforest plant primarily used as spice and vegetable in traditional folk medicine (Ugochukwu and Babady, 2002; Ugochukwu et al, 2003). It contains essential oils, saponins and preganes among others (Schneider et al, 1993; Morebise and Fafunso, 1998; Morebise et al, 2002). Ugochukwu and Babady (2003), Ugochukwu et al, (2003) and Ogundipe et al, (2003) reported that aqueous G. latifolium extracts had hypoglycemic, hypolipdemic and antioxidative properties while Morebise et al, (2002) showed that it has anti-inflammatory properties. These reports are focused mainly on the medicinal properties of the plant with little attempts at investigating their potential nutritional and food processing/preservation values.

The study aims to investigate the protective potential of *Gogronema latifolium* on CCL_4 induced renal toxicity of normal albino rats, hence comparing the levels of creatinine and urea in the rats fed with CCl_4 only, CCl_4 + *Gogronema latifolium* once daily and CCL_4 + *Gogronema latifolium* twice daily with those in the control group using the kidney of normal albino rats.

2. MATERIALS AND METHODS

2.1. Materials

2.1.1. Plant

The leaves of *Gongronema latifolium* were gotten from an uncultivated farmland at Nnewi L.G.A., Anambra State, Nigeria. It was identified by a botanist and was taken to Madonna University Elele campus, Rivers State, Nigeria.

2.1.2. Plant extraction

The leaves were air dried at room temperature (25^0C) then shriveled and grinded with a blender. The ground leaves were then soaked into boiling water then cooled. The first sieving process was done using a sieve cloth afterwards heat was applied using a thermostatic water bath to kill the microbes (if any) present in it.

2.1.3. Animal

A total of Twelve (12) healthy Wistar albino rats were used for analysis. They were left to acclimatize to the environment for two weeks. The rats averagely weighed 110-120grams each and were fed with standard pellet diet and water for two weeks and kept in the animal house of Madonna University.

2.2. Experimental method

Four groups were created with three rats per group.

- Group 1 – positive control group and were administered normal saline.
- Group 2 – negative control group and were administered CCl_4
- Group 3 – CCL_4 + extract (1mg/kg body weight) once daily.
- Group 4 – CCL_4 and extract twice daily

0.5 ml/kg body weight of CCL_4 diluted with olive oil (1:1) was employed for inducing kidney damage.

2.2.1. Kidney function assays

2.2.1.1. Creatinine assay

Method: Colorimetric method

2.2.2. Urea assay

Method: Berthelots method

Principle: Urea in serum is hydrolysed to ammonia in the presence of urease. The ammonia is then measured phytochemically by Berthelots reaction.

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Table 1 Effect of Gongronema latifolium extract and CCl_4 on Urea activity

Groups	Treatments	Urea (mmol/l) activity
I	Normal saline only	4.60±0.24 *
II	CCl_4 only	19.70 ±0. 78 *
III	CCl_4 + extract once daily	9.804± 0.64 *
IV	CCl_4 + extract twice daily	6.60 ±0.40

Results were analyzed using students T-test at p<0.05
Data represents mean ± Standard deviation
** Statistically significant*

Table 2 Effect of *Gongronema latifolium* extract and CCl_4 on Urea activity

Groups	Treatments	Urea (mmol/l) activity
I	Normal saline only	3.40±0.07
II	CCl_4 only	10.20 ±3. 24 *
III	CCl_4 + extract once daily	6.004± 1.99 *
IV	CCl_4 + extract twice daily	4.20 ±1.10 *

Results were analyzed using students T-test at p<0.05.
Data represents mean ± Standard deviation
** Statistically difference*

Urea + H_20 NH_3 + hypochlorite + Phenol → Indophenol (blue compound).

3. RESULTS

The table 1 & 2 shows the results obtained from rats that were treated with aqueous extract of *Gongronema latifolium* after renal toxicity has been induced using CCL_4.

4. DISCUSSION AND CONCLUSION

The kidney is sensitive to carbon tetrachloride hence less urine may be formed, leading to a buildup of water in the body (especially in the lungs) and buildup of waste products in the blood. Kidney failure often was the main cause of death in people who died after very high exposure to carbon tetrachloride. Long-term breathing exposure to carbon tetrachloride worsened age related kidney disease in rats.

The administration of carbon tetrachloride led to a statistically significant ($p<0.05$) increase in urea level in the rats during the experimental period. The rats when administered with CCl_4 had higher statistically significant ($p<0.05$) urea levels (19.70±0.78) when compared to the control (4.60±0.24). On administration of extract once daily a reduction in urea level was observed from (19.70±0.78 - 9.80 ±0.64) urea levels respectively, in this case the decrease is not statistically significant when compared to the control, which means that though the plant has a slight effect on the urea level of rats during the experimental period. A similar trend was observed in the case of creatinine level. There was an increase (10.20±3.24) in creatinine level between rats in group II that were administered with the toxin (carbon tetrachloride) against the control group. This increase is statistically significant ($p<0.05$) compared to the control. However, when *Gongronema latifolium* extract was administered once daily, the creatinine level decreased from (10.20±3.24 - 6.00±1.99) creatinine levels respectively. The decrease is statistically significant when compared to control. Also there was a further reduction in creatinine level when the dosage was increased to twice daily from (6.00 ±1.99 - 4.20 ±1.10) creatinine levels respectively.

In conclusion, it can be deduced from the results obtained that CCL_4 induced renal toxicity in rats and disturbed lipid synthesis and *Gongronema latifolium* leaves were able to reverse the condition by reducing the level of urea and creatinine which are markers of kidney dysfunction. Thus it is suggested based on the results obtained that *Gongronema latifolium* helps in reversing the damage done to the kidney cells as typified due to decrease in urea and creatinine levels.

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